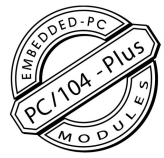

CPC304

PC/104-*Plus*
AMD Geode LX 800 Based
Processor Module

User Manual

Rev. 001a E

August 2008

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Fastwel welcomes suggestions, remarks and proposals regarding the form and the content of this Manual.

Notation Conventions

Warning, ESD Sensitive Device!

This symbol draws your attention to the information related to electro static sensitivity of your product and its components. To keep product safety and operability it is necessary to handle it with care and follow the ESD safety directions.

Warning!

This sign marks warnings about hot surfaces. The surface of the heatsink and some components can get very hot during operation. Take due care when handling, avoid touching hot surfaces!

Caution: Electric Shock!

This symbol warns about danger of electrical shock (> 60 V) when touching products or parts of them. Failure to observe the indicated precautions and directions may expose your life to danger and may lead to damage to your product.

Warning!

Information marked by this symbol is essential for human and equipment safety.
Read this information attentively, be watchful.

Note...

This symbol and title marks important information to be read attentively for your own benefit.

General Safety Precautions

This product was developed for fault-free operation. Its design provides conformance to all related safety requirements. However, the life of this product can be seriously shortened by improper handling and incorrect operation. That is why it is necessary to follow general safety and operational instructions below.

Warning!

All operations on this device must be carried out by sufficiently skilled personnel only.

Warning!

When handling this product, special care must be taken not to hit the heatsink (if installed) against another rigid object. Also, be careful not to drop the product, since this may cause damage to the heatsink, CPU or other sensitive components as well.

Please, keep in mind that any physical damage to this product is not covered under warranty.

Note:

This product is guaranteed to operate within the published temperature ranges and relevant conditions. However, prolonged operation near the maximum temperature is not recommended by Fastwel or by electronic chip manufacturers due to thermal stress related failure mechanisms. These mechanisms are common to all silicon devices, they can reduce the MTBF of the product by increasing the failure probability. Prolonged operation at the lower limits of the temperature ranges has no limitations.

Caution, Electric Shock!

Before installing this product into a system and before installing other devices on it, always ensure that your mains power is switched off.

Always disconnect external power supply cables during all handling and maintenance operations with this module to avoid serious danger of electrical shock.

Unpacking, Inspection and Handling

Please read the manual carefully before unpacking the module or mounting the device into your system. Keep in mind the following:

ESD Sensitive Device!

Electronic modules and their components are sensitive to static electricity. Even a non-perceptible by human being static discharge can be sufficient to destroy or degrade a component's operation! Therefore, all handling operations and inspections of this product must be performed with due care, in order to keep product integrity and operability:

- Preferably, unpack or pack this product only at EOS/ESD safe workplaces. Otherwise, it is important to be electrically discharged before touching the product. This can be done by touching a metal part of your system case with your hand or tool. It is particularly important to observe anti-static precautions when setting jumpers or replacing components.
- If the product contains batteries for RTC or memory back-up, ensure that the module is not placed on conductive surfaces, including anti-static mats or sponges. This can cause short-circuit and result in damage to the battery and other components.
- Store this product in its protective packaging while it is not used for operational purposes.

Unpacking

The product is carefully packed in an antistatic bag and in a carton box to protect it against possible damage and harmful influence during shipping. Unpack the product indoors only at a temperature not less than +15°C and relative humidity not more than 70%. Please note, that if the product was exposed to the temperatures below 0°C for a long time, it is necessary to keep it at normal conditions for at least 24 hours before unpacking. Do not keep the product close to a heat source.

Following ESD precautions, carefully take the product out of the shipping carton box. Proper handling of the product is critical to ensure correct operation and long-term reliability. When unpacking the product, and whenever handling it thereafter, be sure to hold the module preferably by the front panel, card edges or ejector handles. Avoid touching the components and connectors.

Retain all original packaging at least until the warranty period is over. You may need it for shipments or for storage of the product.

Initial Inspection

Although the product is carefully packaged, it is still possible that shipping damages may occur. Careful inspection of the shipping carton can reveal evidence of damage or rough handling. Should you notice that the package is damaged, please notify the shipping service and the manufacturer as soon as possible. Retain the damaged packing material for inspection.

After unpacking the product, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact Fastwel's official distributor from which you have purchased the product for additional instructions. Depending on the severity of the damage, the product may even need to be returned to the factory for repair. DO NOT apply power to the product if it has visible damage. Doing so may cause further, possibly irreparable damage, as well as result in a fire or electric shock hazard.

If the product contains socketed components, they should be inspected to make sure they are seated fully in their sockets.

Handling

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

In order to keep Fastwel's warranty, you must not change or modify this product in any way, other than specifically approved by Faswel or described in this manual.

Technical characteristics of the systems in which this product is installed, such as operating temperature ranges and power supply parameters, should conform to the requirements stated by this document.

Retain all the original packaging, you will need it to pack the product for shipping in warranty cases or for safe storage. Please, pack the product for transportation in the way it was packed by the supplier.

When handling the product, please, remember that the module, its components and connectors require delicate care. Always keep in mind the ESD sensitivity of the product.

Three Year Warranty

Fastwel Co. Ltd. (Fastwel), warrants that its standard hardware products will be free from defects in materials and workmanship under normal use and service for the currently established warranty period. Fastwel's only responsibility under this warranty is, at its option, to replace or repair any defective component part of such products free of charge.

Fastwel neither assumes nor authorizes any other liability in connection with the sale, installation or use of its products. Fastwel shall have no liability for direct or consequential damages of any kind arising out of sale, delay in delivery, installation, or use of its products.

If a product should fail through Fastwel's fault during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.

Warranty period for Fastwel products is 36 months since the date of purchase.

The warranty set forth above does not extend to and shall not apply to:

1. Products, including software, which have been repaired or altered by other than Fastwel personnel, unless Buyer has properly altered or repaired the products in accordance with procedures previously approved in writing by Fastwel.
2. Products, which have been subject to power, supply reversal, misuse, neglect, accident, or improper installation.

Returning a product for repair

1. Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization.
2. Attach a failure inspection report with a product to be returned in the form, accepted by customer, with a description of the failure circumstances and symptoms.
3. Carefully package the product in the antistatic bag, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties. Then package the product in a safe container for shipping.
4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer.

1 Introduction

This document presents general information on CPC304 processor module, the details of its proper and safe installation, configuration and operation. The issues of PC/104 modules and external devices connection are also considered.

1.1 Module Introduction

CPC304 is a PC/104-Plus single board computer for embedded applications. It is designed for use in mission critical on-board systems requiring low power consumption and wide operating temperature range. CPC304 is based on AMD Geode LX800 CPU and AMD CS5536 I/O companion. CPC304 provides full support for PC/104 and PC/104-Plus expansion modules and data exchange via both 16-bit ISA and 32-bit PCI buses.

All key components including CPU, chipset, memory, and periphery controllers are soldered on-board providing excellent vibration stability and increased efficiency of protective conformal coating.

CPC304 offers wide variety of data display capabilities. It allows simultaneous operation of standard VGA interface, 24-bit LVDS interface, and 18-bit interface for TFT or DSTN LCD panels connection.

Data storage subsystem is based on single-channel IDE controller, that is able to drive two IDE devices: two external hard drives connected via on-board connectors, CompactFlash card, or soldered on-board 128 MB flash disk.

For data exchange, CPC304 uses up to two independent Fast Ethernet ports, up to four COM ports, two USB 2.0 ports, and eight programmable discrete input/output lines.

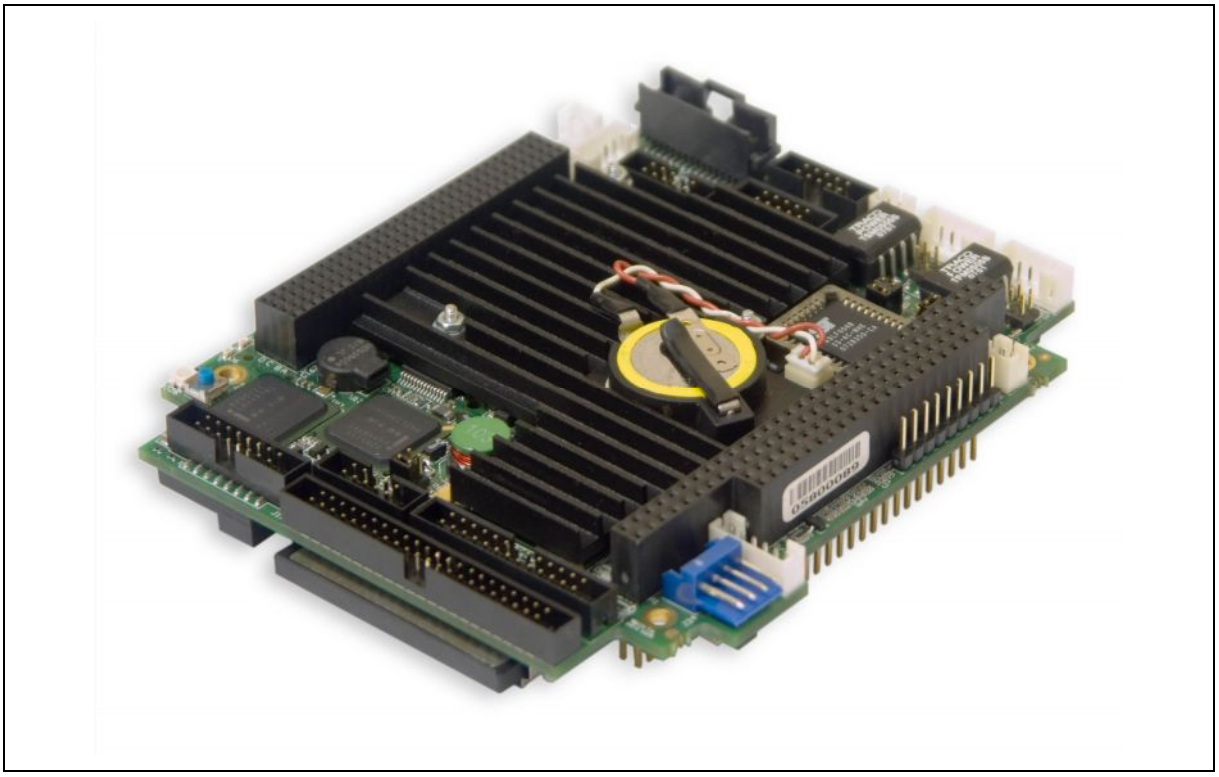
System control and management capabilities of CPC304 include two watchdog timers, opto-isolated remote reset input, external signal system wake-up controller, reserved BIOS, and possibility to save system configuration and emergency parameters in FRAM chip.

CPC304 is manufactured in two versions: CPC304-01, full function version, and CPC304-02, "light-weight" version without LVDS interface and on-board 128 MB NAND flash disk, with one Fast Ethernet channel and three COM ports.

CPC304 is designed for operation within industrial temperature range from –40°C to +85°C.

CPC304 supports wide range of operating systems – MS DOS, QNX 4.25 and 6.3x, Windows 2000, XPe, CE5, RTOS32, and Linux.

Figure 1.1: CPC304 Module Appearance



The appearance may vary for different versions of the module.

1.2 CPC304 Versions

At the present time the CPC304 module is manufactured in two basic versions differing in interface capabilities.

Table 1.1: CPC304 Versions

Version	Decimal ID	LVDS	NAND Flash	Ethernet	Serial Ports
CPC304-01	467444.013	+	+	2	COM1-COM4
CPC304-02	467444.013-01	–	–	1	COM1-COM3

1.3 Delivery Checklist

Table 1.2: CPC304 Supplied Set

Code	Description	Note
CPC304-01 or CPC304-02	Processor module (467444.013 or 467444.013-01)	–
–	Cable for 2.5" HDD connection to 44-contact header	
CDM02	Adapter module for connection of 3.5" HDD or CD-ROM drive	
ACS00023	DB9F to IDC10 adapter cable for connection to COM1 or COM2 ports	
–	CD ROM with documentation and service software	
	Antistatic bag and consumer carton box	

Note:

Keep the antistatic bag and the original package at least until the warranty period is over. It can be used for future storage or warranty shipments.

1.4 Additional Accessories

Peripheral devices are attached to the module directly or via additional accessories and cables listed in the following table.

Table 1.3: CPC304 Additional Accessories

Name	Decimal Code	Description
KIB380	696515.004	Interface expansion module with cable set
TBA	–	To be amended

Additional accessories are not supplied with the processor module, are ordered separately.

1.5 Supplementary Information

1.5.1 Related Documents

Information related to this product and its components can be found in the following documents:

Table 1.4: Related Publications

Product	Publication
CompactFlash cards	CF+ and CompactFlash Specification Revision 1.4
Processor	AMD Geode™ LX Processor Reference Schematic AMD Geode™ LX Processors Data Book AMD Geode™ CS5536 Companion Device Preliminary Data Book AMD Geode™ LX Processor and CS5535/CS5536 Companion Devices Layout Recommendations
Super I/O	Winbond W83627 SuperIO Data sheet

2 Technical Specifications

2.1 General

- CPU: AMD Geode LX800 500 MHz
  - 32-bit x86/x87 compatible
  - 64-bit coprocessor
  - 64-bit memory bus
  - 64 KB L1, 128 KB L2 cache
  - Integrated FPU supports the Intel MMX™ and AMD 3DNow!™ Technology instruction sets
- System memory
  - 256 MB soldered SDRAM
  - DDR333
- Flash BIOS
  - 2x512 KB, reserved
  - In-system modification
- Solid State Disk (CPC30401 only)
  - Soldered
  - 128 MB NAND flash
  - IDE interface
  - MS DOS-compatible Fastwel file system
- Storage:
  - Compact Flash Type I/II socket on board (bottom side)
  - Support for up to two UltraDMA-100 IDE devices (via a 10 cm cable)
- Serial ports
  - Four serial ports (for CPC304-01)
  - High speed NS16C550 compatible
  - COM1, COM2: RS232, 9 wires, up to 115.2 Kb/s
  - COM3, COM4: RS422/485, up to 115.2 Kb/s, FIFO buffer for each channel – 64 bytes (for CPC304-02 COM3 only)
- USB
  - Two USB 2.0 channels
- Ethernet
  - Two Fast Ethernet ports 10/100 Mb/s (for CPC304-02 – one channel)
- Video controller
  - 2D accelerator
  - Video memory 60 MB shared with system
  - LCD (TFT or DSTN) panels support, resolution up to 1024x768 at 60 Hz

- LVDS interface
- 18-bit color via TFT interface, 24-bit color via LVDS
- Analog display support,
  resolution 1600×1200 at 100 Hz, 1920×1440 at 85 Hz, 32-bit

- Discrete I/O
  - 8-bit discrete I/O port
- Watchdog timers
  - Two watchdog timers with LED indication
- Safety
  - System configuration settings stored in CMOS+SFRAM
  - Saving essential user data in SFRAM in case of power failure
- RTC
  - On-board real time clock with Li battery
- PS/2
  - PS/2 keyboard and mouse interface
- FDD
  - Floppy disk interface
- Parallel port
  - SPP/ECP/EPP compatible. Header, shared with FDD controller
- Optoisolated Reset input
- PC/104 and PC/104-Plus expansion headers
- Software Support:
  - General Software® BIOS
  - DOS, QNX® 4.25 and 6.3x, Windows 2000, CE5, XPe, RTOS32, Linux®

2.2 Power Requirements

The module is powered by an external DC power source providing the following characteristics:

- Voltage: +5 V ±5% (from +4.75 V to +5.25 V)
- Consumption current (without external devices): CPC304 – 1.3 A

Important:

+12 V voltage is not used by the module.

+12 V line from power supply connector is routed to the PC/104 header contact.

2.3 Environmental

- Operating temperature range from: -40°C to +85°C
- Storage temperature: -55°C to +90°C
- Relative humidity: 5% to 95% at 25°C, noncondensing

2.4 Mechanical

- Vibration – 5g;
- Single shock, peak acceleration – 100 g;
- Multiple shock, peak acceleration – 50 g.

2.5 Dimensions and Weight

- Dimensions, not more: 115.6 × 101.5 × 23.7 mm (4.55” × 4” × 0.93”)
  (see also section 4.4 for mounting dimensions)
- Weight, not more: 0.1 kg
  (without heatsink and CompactFlash card)

2.6 MTBF

- MTBF for CPC304 is 170000 hours.

  The value is calculated according to: Telcordia Issue 1 model, Method I Case 3, for continuous operation at a surface location, at normal environmental conditions (Russian State Standard GOST 15150-69, "UHL4" climatic parameters) and at ambient temperature 30°C.

3 External Connections

The following precautions must be observed to ensure proper installation and to avoid damage to the module, other system components, or harm to personnel.

3.1 Safety Regulations

The following safety regulations must be observed when installing or operating the module. Fastwel assumes no responsibility for any damage resulting from infringement of these rules.

Warning!

When handling or operating the module, special attention should be paid to the heatsink, because it can get very hot during operation. Do not touch the heatsink when installing or removing the module.

Moreover, the module should not be placed on any surface or in any kind of package until the module and its heatsink have cooled down to ambient temperature.

ESD Sensitive Equipment!

This product comprises electrostatically sensitive components. Please follow the ESD safety instructions to ensure module's oparability and reliability:

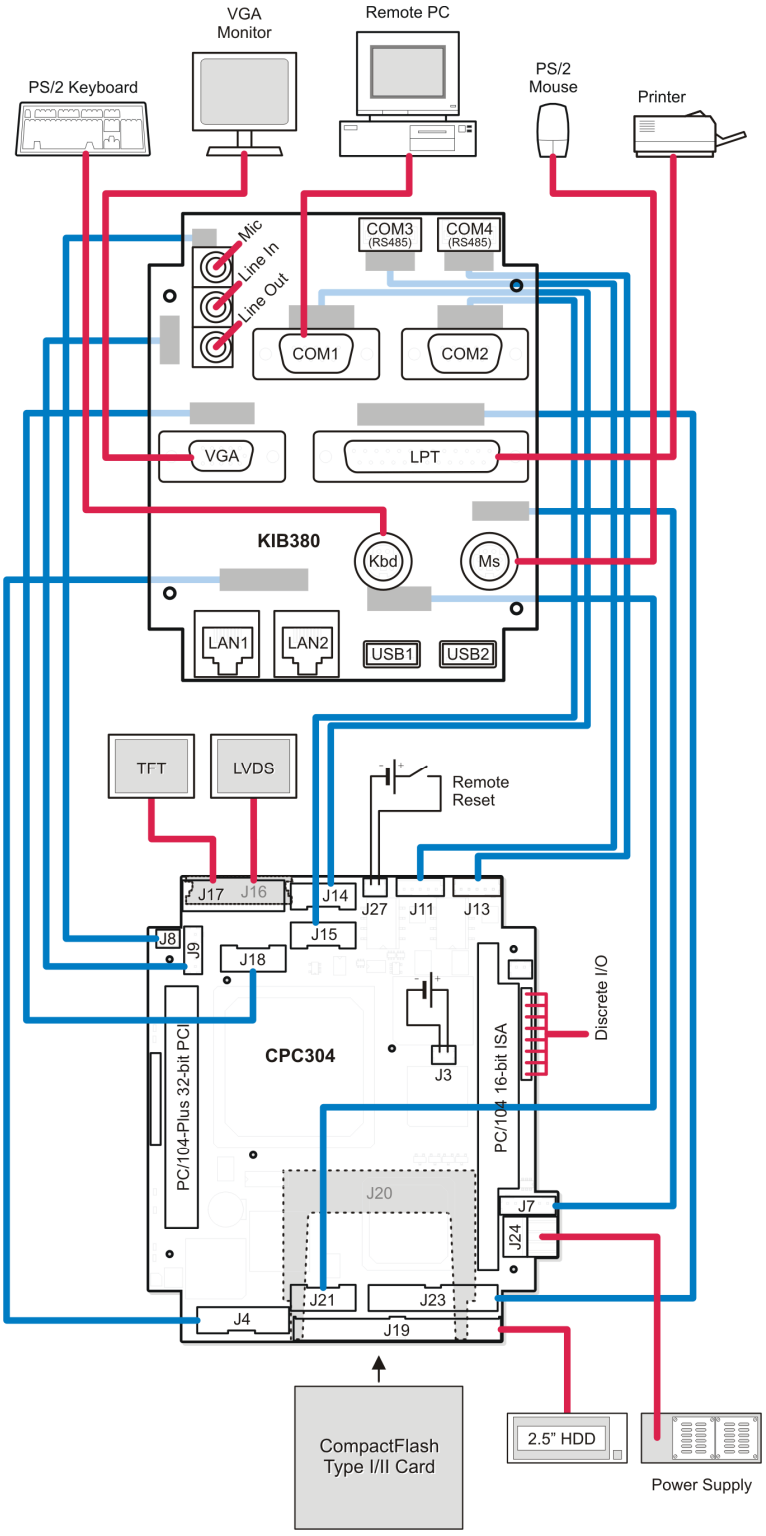
- Use grounding equipment, if working at an anti-static workbench. Otherwise, discharge yourself and the tools in use before touching the sensitive equipment.
- Try to avoid touching contacts, leads and components.

Extra caution should be taken in cold and dry weather.

3.2 Connection of Peripheral Devices

External devices are connected to CPC304 directly or via KIB380 interface expansion module.

Figure 3.1: External Devices Connection

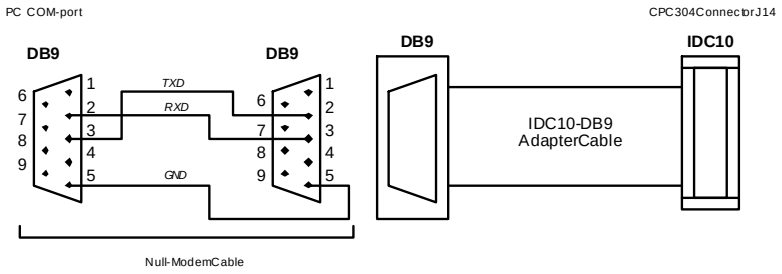


The following devices are necessary to put the module into operation:

- Power supply unit with +5 V and not less than 2 A output connected to J24 power connector. If the module is intended for operation with PC/104 modules requiring +12 V, then this voltage should be supplied to the appropriate J24 contact.
  For checkout and adjustment purposes the AT or ATX power supply units are recommended;
- The following devices may be connected to the module to serve as a display unit:
  - Monitor of a remote PC (console operation) connected via DB9F – IDC10 adapter cable to J14 connector or via a null-modem cable to COM1 connector of KIB380;
  - SVGA monitor directly connected to VGA connector of KIB380 interface expansion module or to CPC304 J18 connector via adapter;
  - TFT/DSTN panel connected to J17 connector of CPC304;
- Y-cable allowing to connect a mouse and a keyboard to the module's J7 connector. These two devices can also be connected directly to PS/2 connectors of KIB380 expansion module.

The operating system is loaded from the on-board NAND Flash memory. Operating system on this flash-disk is FDOS supplemented with utilities.

Figure 3.2: Cables Connection for Console Operation



The Hyperterminal program running on the PC to support console operation should have the following settings:

Transfer rate – 115200 bit/s
Data bits – 8
Stop bits – 1
Parity check – Off

3.2.1 CompactFlash Cards Installation

CompactFlash socket of CPC304 (J20) supports 5 V CompactFlash ATA type I/II cards. Carefully slide in the correctly oriented card and gently press to engage the contacts completely.

Note:

Connection of the CompactFlash cards while the power is on may damage your system.

CompactFlash socket description can be found in Subsection 4.3.5.

3.2.2 USB Devices Connection

CPC304 can accept Plug&Play connection of USB 2.0 computer peripheral devices (printers, keyboards, mice, etc.) All USB devices may be connected or disconnected while the host power is on. Direct USB devices connection is possible via KIB380 interface expansion module.

3.2.3 Battery Replacement

The lithium battery must be replaced with the battery in plastic enclosure supplied by Fastwel.

The expected life of a 190 mAh battery is about 5 years. However, this typical value may vary because battery life depends on the operating temperature and the shutdown time of the system in which the battery is installed.

Note...

I It is recommended to replace the battery after approximately 4 years to be sure it is operational.

Important:

Replacing the battery, make sure the polarity is correct.

Dispose of used batteries according to the local regulations.

3.3 Software Installation

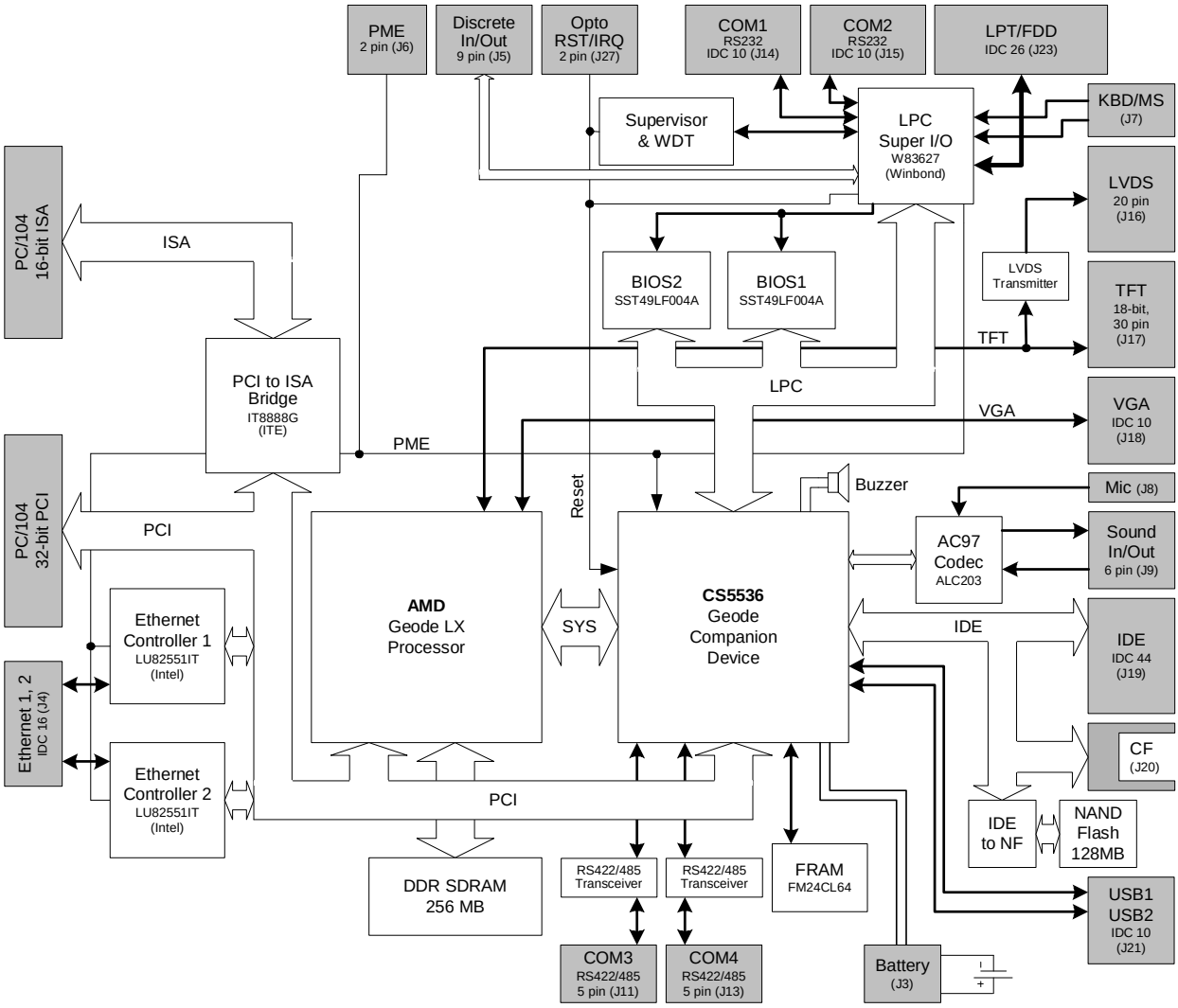
The installation of the peripheral drivers is described in the accompanying information files. For details on installation of an operating system, please refer to the relevant software documentation.

4 Functional Description

4.1 Structure and Layout

Functional diagram of the CPC304 module is shown in Figure 4.1.

Figure 4.1: CPC304 Block Diagram



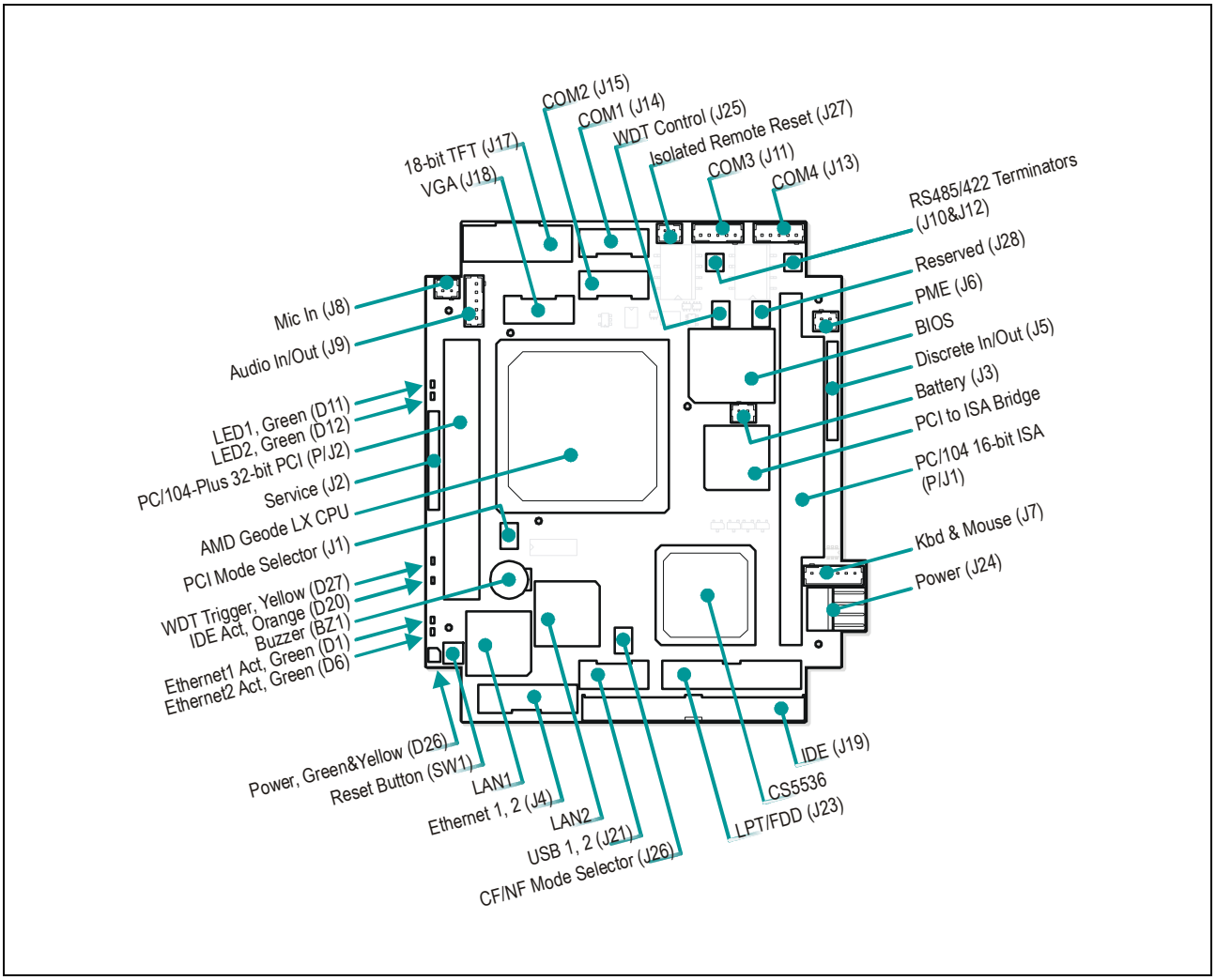
CPC304 includes the following main functional units:

- AMD Geode LX 800 500 MHz microprocessor, including 32-bit x86 core, 64-bit coprocessor, 64-bit SDRAM memory bus;
- 256 MB soldered DDR SDRAM system memory;
- Flash memory based reserved BIOS, in-system modification;
- Onboard flash-disk, 128 MB;
- IDE port with support for two UltraDMA/100 devices;
- CompactFlash port;
- Serial ports:
  - COM1, COM2: RS232, full control, maximum exchange rate – 115.2 Kbit/s*;
  - COM3, COM4: RS422/RS485, isolated, up to 115.2 Kbit/s*;
- Two Fast Ethernet channels 10/100 Mbit/s;
- Two USB 2.0 channels;
- Eight digital I/O lines
- Two watchdog timers;
- CMOS+SFRAM for BIOS configuration storage;
- Real time clock with Li battery backup;
- PS/2 keyboard/mouse port;
- FDD/LPT shared header. Universal parallel port supports EPP and ECP modes;
- TFT, VGA, and LVDS connectors;
- Integrated graphics controller:
  - Video memory up to 60 MB, shared with system;
  - LCD (TFT or DSTN) panels support, resolution up to 1024×768;
  - Analog RGB display support;
  - LVDS interface
- Optoisolated remote Reset*

* – *For current BIOS version*

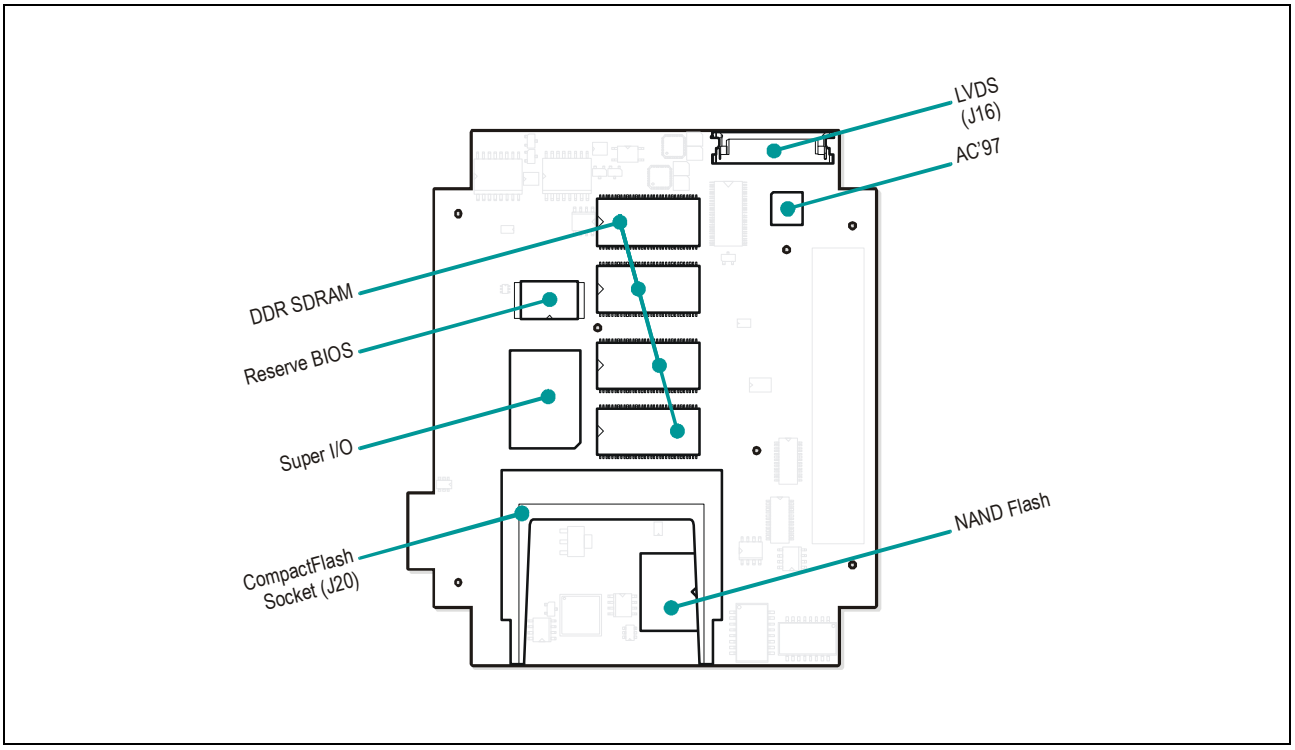
Layouts of main CPC304 components and connectors on top and bottom sides are presented in Figures 4.2 and 4.3 respectively.

Figure 4.2: Top Side: Connectors and Main Components Layout



The layout may slightly differ for various versions of the board.

Figure 4.3: Bottom Side: Connectors and Main Components Layout



The layout may slightly differ for various versions of the board.

4.2 Address Mapping

4.2.1 Memory Addressing

Table 4.1: Memory Address Mapping

Address Range	Size	Description
00000h – 09FFFh	640 KB	System memory
A0000h – BFFFFh	128 KB	Video memory
C0000h – C7FFFh	32 KB	Display BIOS memory or external bus memory
C8000h – DFFFFh	96 KB	External bus memory
E0000h – FFFFFh	128 KB	System BIOS area
		Note: This table contains preliminary information

4.2.2 I/O Addressing

Table 4.2: I/O Address Space

Address Range	Function	Note
0000h – 001Fh	DMA1	–
0020h – 0021h	PIC Master	–
0022h – 0023h	LX Configuration	–
0028h – 002Fh	Local Bus	–
0040h – 005Fh	Timer	–
0060h – 006Fh	POST, Keyboard shadow registers	–
0070h – 007Fh	CMOS, NMI Mask Control Registers	–
0080h – 009Fh	DMA Page Registers	–
00A0h – 00BFh	Slave PIC	–
00C0h – 00DFh	DMA2	–
00F0h – 00FFh	Numeric Coprocessor	–
0100h – 016Fh	External ISA bus	External bus access
0170h – 0177h	Secondary IDE	–
0180h – 01EFh	External ISA bus	External bus access
01F0h – 01F7h	Primary IDE	
0200h – 026Fh	External ISA bus	External bus access
0270h – 027Fh	Reserved	–
0280h – 02E7h	External ISA bus	External bus access
02E8h – 02EFh	COM4	RS422/485
02F8h – 02FFh	COM2	RS232
0300h – 036Fh	External ISA bus	External bus access
0370h – 0377h	Reserved	–
0378h – 037Fh	LPT1	–
0380h – 03AFh	Reserved	–
03B0h – 03BBh	MDA	–
03BCh – 03BFh	Parallel port MDA	–
03C0h – 03DFh	EGA, VGA, CGA	–
03E8h – 03EFh	COM3	RS422/485
03F0h – 03F5h	FDD Controller	–
03F6h	Reserved	–
03F7h	FDD Controller	–
03F8h – 03FFh	COM1	RS232
0400h – FFFFh	External ISA bus	External bus access
0CF8H – 0CFFH	Host PCI controller configuration registers	–

4.2.3 Interrupt settings

By default, interrupts are generated by the devices belonging to the CPC304 module. Among the alternative interrupt generating devices are: expansion modules on ISA system bus or PCI bus (PC/104 connector) and optoisolated Reset input.

Table below presents interrupt settings. Interrupt request configuration is performed in BIOS Setup.

Table 4.3: Interrupt Settings

IRQ	Default Source	Alternative Source
IRQ0	System timer	–
IRQ1	Keyboard	–
IRQ2	8259 interrupt	–
IRQ3	COM2	IRQ3 line of external ISA bus
IRQ4	COM1	IRQ4 line of external ISA bus
IRQ5	Ethernet / USB / Audio	IRQ5 line of external PCI bus
IRQ6	FDD	IRQ6 line of external ISA bus
IRQ7	LPT	IRQ7 line of external ISA bus
IRQ8	RTC	–
IRQ9	Ethernet / USB / Audio	IRQ9 line of external PCI bus
IRQ10	IRQ10 line of external ISA	–
IRQ11	IRQ11 line of external ISA	–
IRQ12	Mouse	–
IRQ13	Reserved for math. coprocessor	–
IRQ14	HDD, CompactFlash	–
IRQ15	COM3, COM4	External optoisolated input*
	Note: This table contains preliminary information ** – not available for current version*	

4.2.4 DMA Channels

Table 4.4: DMA Request Map

DMA Channel	Main Function	Alternative Source
0	Reserved	–
1	LPT	DRQ1 line of external ISA bus
2	FDD	–
3	DRQ3 line of external ISA bus	–
4	Slave controller	–
5	DRQ5 line of external ISA bus	–
6	DRQ6 line of external ISA bus	–
7	DRQ7 line of external ISA bus	–

4.3 Functional Description

4.3.1 Microprocessor

The module is based on AMD Geode LX800 microprocessor with 1.8W typical power consumption at 500 MHz, maximum power 3.6W (TDP). The processor includes 32-bit x86 core, 64-bit coprocessor and 64-bit DDR memory bus up to 400 MHz, graphics and video controller with VGA monitors and LCD panels simultaneous operation support. FPU of the processor supports MMX™ and AMD 3DNow!™ technology instruction sets. The CPU is complemented with AMD Geode CS5536 companion device providing support for numerous I/O functions including IDE, USB, audio, and power management interfaces.

4.3.2 SDRAM Memory

Four DDR 333 SDRAM memory chips are soldered on the bottom side of the PCB. Total memory size is 256 MB.

4.3.3 Reserved Flash BIOS

The CPC304 takes advantage of flash-memory based BIOS. Two Flash BIOS chips storage capacity is 512 KB each. The main (working) copy of BIOS occupies 512 KB on a chip in PLCC32 panel. Reserve BIOS copy is stored on a soldered chip and is used for emergency boot. Switching between the main and reserve BIOS copies is performed automatically.

It is possible to upgrade the main copy of BIOS in-system. It is done with the help of **fwflash.exe** program. For example:

```
fwflash.exe b304v1_3.bin
```

where b304v1_3.bin – BIOS image binary file name.

BIOS can be upgraded via RS232 (COM1) serial port in console operation mode. To do so, connect COM ports of the module and of a remote PC, enable Start RS232 Manufacturing Link mode in BIOS Setup, and run fwflash.exe utility at a remote PC with the following parameters:

```
fwflash.exe b304v1_3.bin 1
```

where b304v1_3.bin – BIOS image binary file name

1 – PC COM port number (COM1)

4.3.4 UIDE Interface

J19 connector of CPC304 (Figure 4.2) allows connection of two UDMA-100 compatible devices (master and slave) to the primary IDE channel. J19 connector is a 44-pin 2 mm pitch header. Its pinout is shown in the following table. UDMA-100 is supported with a 10 cm cable only.

Table 4.5: J19 HDD Connector Pinout

Pin#	Signal	Pin#	Signal	Pin#	Signal	Pin#	Signal
1	/RESET	12	DD12	23	/IOW	34	–
2	GND	13	DD2	24	GND	35	DA0
3	DD7	14	DD13	25	/IOR	36	DA2
4	DD8	15	DD1	26	GND	37	/CS1
5	DD6	16	DD14	27	/IOCHRDY	38	/CS3
6	DD9	17	DD0	28	GND	39	DASP
7	DD5	18	DD15	29	/DACK	40	GND
8	DD10	19	GND	30	GND	41	+5V
9	DD4	20	–	31	IRQ	42	+5V
10	DD11	21	DRQ	32	/CS16	43	GND
11	DD3	22	GND	33	DA1	44	–

The ACS00010 FC44 cable allows direct connection of a 2.5" HDD to the J19 connector. Other IDE devices (3.5" HDD, CD-ROM) having 40-contact 2.5 mm pitch connector can be connected to CPC304 via the CDM02 (469535.023) adapter. This adapter is connected directly to the 40-pin contact connector of the IDE device, and with the ACS00010 FC44 cable is connected to CPC304 J19 connector.

4.3.5 CompactFlash Socket

CompactFlash Type I/II cards can be connected to J20 socket on the bottom side of CPC304. The device in this socket share Primary channel with other IDE devices. When CompactFlash socket is populated, only one IDE device can be connected to CPC304. CompactFlash device can operate as Master or Slave (see J26 jumper positions description) and can be designated as bootable device. The pinout of the J20 socket is presented in the following table.

Table 4.6: J20 CompactFlash Socket Pinout

Pin #	Function	Pin #	Function
1	GND	26	/CD1
2	D03	27	D11
3	D04	28	D12
4	D05	29	D13
5	D06	30	D14
6	D07	31	D15
7	/CS0	32	/CS1
8	A10 (NC)	33	/VS1
9	/ATA SEL	34	/IORD
10	A09 (NC)	35	/IOWR
11	A08 (NC)	36	/WE
12	A07 (NC)	37	INTRQ
13	VCC (+5V)	38	VCC (+5V)
14	A06 (NC)	39	/CSEL
15	A05 (NC)	40	/VS2
16	A04 (NC)	41	/RESET
17	A03 (NC)	42	IORDY
18	A02	43	/INPACK
19	A01	44	/REG
20	A00	45	/DASP
21	D00	46	/PDIAG
22	D01	47	D08
23	D02	48	D09
24	/IOCS16	49	D10
25	/CD2	50	GND

Note: (NC) indicates that this contact is not connected to the module's circuits.
This table is subject to future amenments.

4.3.6 NAND Flash

The capacity of the on-board NAND flash memory chip is 128 MB (CPC304-01). It can be used as a bootable disk or can be disabled in BIOS Setup. NAND flash chip is connected to SST55LD019A IDE controller. Since only one IDE channel is used, it is possible to connect IDE devices in one of the ways described below.

Connection Variant	IDE-Master	IDE-Slave	CF-Master	CF-Slave	NF-Master	NF-Slave
1	+	+	-	-	-	-
2	+	-	-	+	-	-
3	+	-	-	-	-	+
4	-	+	+	-	-	-
5	-	+	-	-	+	-
6	-	-	+	-	-	+
7	-	-	-	+	+	-

Compact Flash and NAND flash operation mode ("master" or "slave") is selected by setting jumpers at J26 pinpad.

Note!

In case the NAND flash chip is not used ("Onboard NAND Flash" option in BIOS setup is set to "Disable"), the jumper at J26 pinpad should be set to position 1-3.

4.3.7 Video Controller and Connection of Monitors

The module utilizes graphics controller integrated in Geode LX CPU with the following main features:

- Video memory size up to 60 MB shared with system;
- Supported resolution up to 1024×768 for TFT or DSTN LCD-panels at 18 bpp, for LVDS panels – at 24 bpp;
- Support of VGA RGB monitors with resolution up to 1920×1440;

CRT VGA monitor is connected to J18 header of CPC304 via adaptor cable or to "VGA" D-Sub connector of KIB380 interface module. The table below shows J18 header pinout.

Table 4.7: VGA: J18 Connector Pinout

Pin#	Signal	Pin#	Signal
1	RED	6	GND
2	GND	7	HSYNC
3	GREEN	8	VSYNC
4	GND	9	SCL
5	BLUE	10	SDA

TFT LCD panels are connected directly to J17 header of CPC304. The following table presents its pinout.

Table 4.8: TFT: J17 Header Pinout

Pin#	Signal	Pin#	Signal
1	GND	16	DRGB13 (G3)
2	DOT_CLK	17	DRGB14 (G4)
3	HSYNC	18	DRGB15 (G5)
4	VSYNC	19	GND
5	GND	20	DRGB2 (B0)
6	DRGB18 (R0)	21	DRGB3 (B1)
7	DRGB19 (R1)	22	DRGB4 (B2)
8	DRGB20 (R2)	23	DRGB5 (B3)
9	DRGB21 (R3)	24	DRGB6 (B4)
10	DRGB22 (R4)	25	DRGB7 (B5)
11	DRGB23 (R5)	26	GND
12	GND	27	DISPEN
13	DRGB10 (G0)	28	+5V
14	DRGB11 (G1)	29	+5V
15	DRGB12 (G2)	30	GND

J16 header of CPC304 is used for connection of LVDS LCD panels.

Table 4.9: LVDS: J16 Connector Pinout

Pin #	Signal	Pin #	Signal
1	VDD_EN	11	TxOUT2+
2	DISPEN	12	TxOUT2-
3	TxOUT0+	13	GND
4	TxOUT0-	14	GND
5	GND	15	TxOUT3+
6	GND	16	TxOUT3-
7	TxOUT1+	17	GND
8	TxOUT1-	18	GND
9	GND	19	TxCLK+
10	GND	20	TxCLK-

4.3.8 Watchdog Timers and Power Votage Monitoring

CPC304 has two watchdog timers. WDT1 is integrated in supervisor chip and has fixed timeout period of 1.6 s. WDT2 is a function of SuperIO chip. It has programmable timeout period from 1 s to 255 minutes. Operation of each watchdog timer trigger special registers, which are available to BIOS function for reading after reboot. The fact of watchdog operation is also reflected by D27 yellow LED.

4.3.8.1 WDT1 and Power Votage Monitoring

Power voltage monitoring and watchdog functions are performed by ADM706T supervisor chip. +5V and +3.3V voltages are monitored. Reset signal is generated when +3.3V voltage drops below +3.08V. The following Super IO GPIO ports are available to control watchdog timer operation:

GPIO22: 1 – to switch WDT1 on; 0 – to switch WDT1 off;

GPIO30 – WDT1 input.

WDT1 is enabled by closing pins 1 and 2 on J25 pinpad.

4.3.8.2 WDT2

A programmable watchdog timer is one of the functions of Super IO chip (Winbond W83627HF). Its setup and control are described in W83627 chip datasheet. Super IO chip is available via 2Eh port.

WDT2 is enabled by closing pins 3 and 4 on J25 pinpad.

4.3.9 PS/2 Keyboard and Mouse Interface

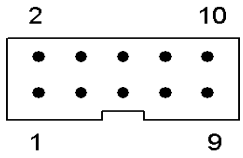
PS/2 keyboard and mouse interface is routed to J7 6-pin header. Mouse and keyboard are connected via KIB380 interface expansion module with "KB" and "MOUSE" connectors or directly to J7 connector of CPC304 using adaptor cable. The following table shows pinout of this connector.

Table 4.10: J7 Contacts Designation

Pin Number	Signal
1	KBD CLK
2	KBD DATA
3	MOUSE CLK
4	GND
5	+5V
6	MOUSE DATA

4.3.10 USB Interface

Figure 4.4: IDC10 Pins Numbering



The module is equipped with two USB 2.0 host ports.
Each channel has separate power control circuit.
One USB device may be connected to each port.
These ports are available via IDC10 2 mm pitch header J21.

USB devices can also be connected via KIB380 interface expansion module, which has two standard 4-pin Type A USB connectors.

Table 4.11: J21 Connector Pinout

Pin Number	Signal
1	USB1_+5V
2	USB2_+5V
3	USB1_DAT-
4	USB2_DAT-
5	USB1_DAT+
6	USB2_DAT+
7	USB1_GND
8	USB2_GND
9	–
10	–

4.3.11 Fast Ethernet Interface

The CPC304 has two 10Base-TX/100Base-TX Ethernet channels provided by two Intel LU82551IT controllers. Both Ethernet ports are available via one 16-pin 2 mm pitch IDC header J4 on the top side of the board (see Figure 4.2).

Table 4.12: J4 Ethernet Header Pinout

Pin Number	Signal
1	LAN1_TX+
2	LAN1_TX-
3	LAN1_RX+
4	NC
5	NC
6	LAN1_RX-
7	NC
8	NC
9	LAN2_TX+
10	LAN2_TX-
11	LAN2_RX+
12	NC
13	GND NC
14	LAN2_RX-
15	NC
16	NC

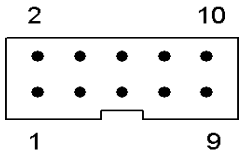
Both channels are available via standard RJ45 connectors on KIB380 interface expansion module.

4.3.12 Serial Ports

The CPC304-01 is furnished with four serial ports, CPC304-02 – with three.

4.3.12.1 COM1 and COM2 (RS232)

Figure 4.5: IDC10 Pins Numbering



COM1 and COM2 ports have standard PC AT base addresses. They are routed to J14 and J15 IDC10 connectors (2 mm pitch) and operate as full function 9-wire RS232 interfaces with maximum transfer rate of 115.2 Kb/s. They are fully compatible with UART16550.

Both COM1 and COM2 ports can be used for communication with a remote PC. For console operation and file exchange a null-modem cable is needed. COM1 is used for this purpose by default.

The following table shows pins designation for J14 and J15 headers.

Table 4.13: J14 and J15 Pin Assignments

Pin #	Signal	Pin #	Signal
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI
9	GND	10	+5V

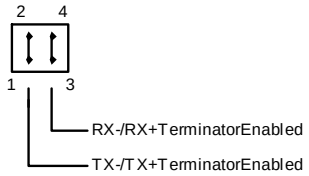
When using KIB380 interface expansion module, both ports are available via two standard DB9 connectors.

4.3.12.2 COM3 and COM4 (RS-485/RS-422)

COM3 and COM4 ports allow data transmission rates up to 115.2 Kb/s and support RS-422/RS-485 interfaces. These two ports are routed to J11 and J13 one-row 5-pin on-board connectors.

The jumpers of the J10 (for COM3) and J12 (for COM4) pinpads connect terminators to RS-485/RS-422 signal lines. The pins of these pinpads have identical designation shown in the following figure.

Figure 4.6: J10 and J12 Pinpads



To use COM3 or COM4 ports in RS-422 or RS-485 mode, do the following:

- Set jumpers on the pinpad corresponding to the port;
- Initialize the port by software

Figure below shows two modules connected in RS-422 mode. The jumper connecting terminator is set on receive lines only (lines RX+ and RX-). In RS-485 mode the terminators are connected only on devices at the ends of the line (on the next figure). The terminators' resistance is 120 Ohm. Complete description of other jumpers can be found in Appendix A.

Figure 4.7: Point-to-Point Connection of Two Modules in RS-422 Mode

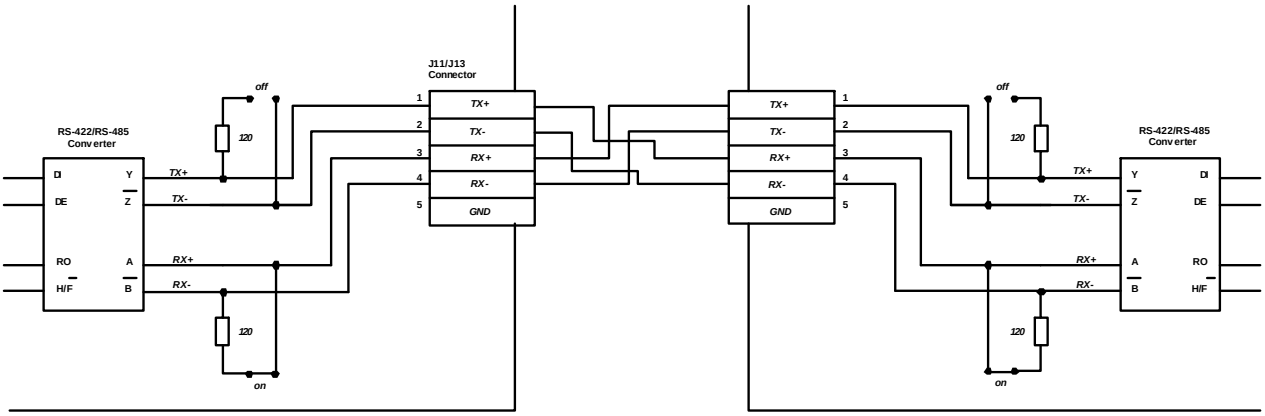
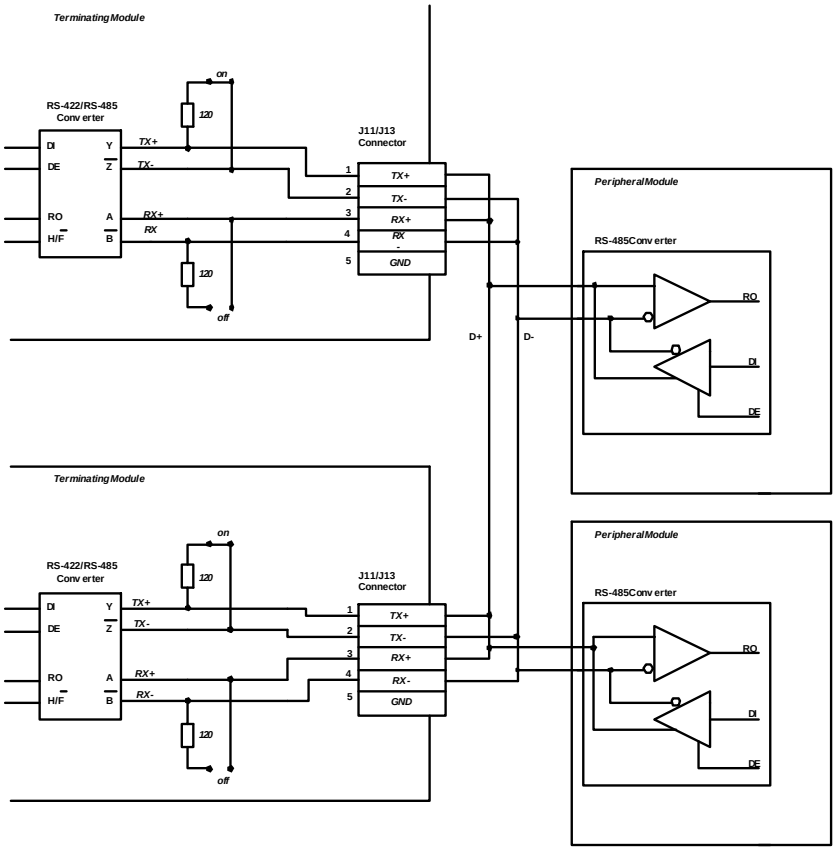


Figure 4.8: Connection of Several Devices in RS-485 Mode



4.3.13 FDD/LPT Port

J23 is a 26-pin IDC connector shared by LPT and FDD ports. Switching between LPT and FDD ports is performed in BIOS Setup. LPT port of CPC304 supports EPP and ECP operation modes. ECP is the default mode.

LPT uses IRQ7 interrupt line, IRQ6 is assigned to FDD port. Interrupts from these ports can be disabled and switched for use by ISA bus devices in BIOS Setup program.

A floppy disk drive is connected to J23 header via the (TBD) cable and CDM01 (469535.030) transition module, which is installed directly on 34-pin FDD connector.

A printer is connected to DB25F connector at KIB380 interface expansion module.

The table below describes pin assignments of J23 connector.

Table 4.14: LPT/FDD J23 Connector Pinout

Pin #	LPT1 Signals	FDD Signals
1	/STB	–
2	/AFD	DRVDEN
3	PD0	/INDEX
4	/ERROR	/HEAD
5	PD1	/TRACK
6	/INIT	/DIR
7	PD2	/WP
8	/SLCTIN	/STEP
9	PD3	/RDATA
10	GND	GND
11	PD4	/DSKCHG
12	GND	GND
13	PD5	–
14	GND	GND
15	PD6	/MOA
16	GND	GND
17	PD7	/DSA
18	GND	GND
19	/ACK	/DSB
20	GND	GND
21	BUSY	/MOB
22	GND	GND
23	PE	/WD
24	GND	GND
25	SLCT	/WE
26	+5V	+5V

4.3.14 RTC and Serial FRAM

The module is equipped with a standard Real Time Clock. FRAM is non-volatile memory with I2C serial interface. It serves as a back-up storage for BIOS Setup parameters and for restoration of the RTC memory if an error is detected. Free FRAM memory units (7 KB) now are not available to the user via INT17H BIOS function (subject to change).

For long-term storage of the CPC304 module disconnect RTC battery by disengaging power cable from J3 connector.

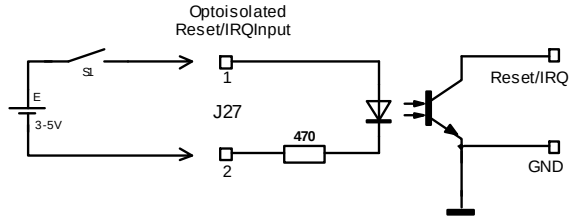
In case of operating system crash and if BIOS Setup program can not be started, BIOS settings can be reset using CMOS_RST.COM program. It is started under MS DOS 6.22 on a remote PC connected to switched off CPC304 module with a null-modem cable via COM1 port. After this procedure, BIOS settings are reset to default ones on module's power-up.

4.3.15 Optoisolated Reset Input

The module has one optoisolated discrete input J27, which can be used for remote reset.

Remote reset source voltage is 3 to 5 V.

Figure 4.9: Discrete Input Optoisolation



4.3.16 J25 Pinpad

J25 pinpad jumpers allow to enable/disable watchdog timers of the module. To enable close appropriate contacts, to disable open.

This subsection will be corrected in future versions of the document.

Table 4.15: J25 Jumpers Positions

Jumper Position	Function
1-2	Enable WDT1
3-4	Enable WDT2

4.3.17 J26 Pinpad

Compact Flash and NAND flash operation mode ("master" or "slave") is selected by setting jumpers at J26 pinpad.

Note!

In case the NAND flash chip is not used ("Onboard NAND Flash" option in BIOS setup is set to "Disable"), the jumper at J26 pinpad should be set to 3-4 position.

Table 4.16: J26 Jumpers Positions

Jumper Position	Function
3-4	Compact Flash – Master, Nand Flash – Slave
1-2	Compact Flash – Slave, Nand Flash – Master

4.3.18 J28 Pinpad

J28 is a reserved jumper switch.

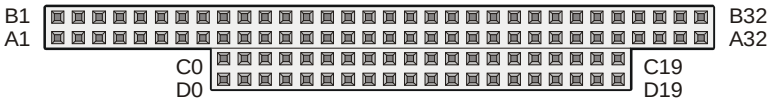
Note!

Pins 1-3 and 4-6 must be closed during operation!

4.3.19 ISA Header

P/J1 header mounted on CPC304 allows connection of PC/104 expansion modules via ISA bus. The processor module can accommodate 4 PC/104 expansion modules maximum. The contact configuration of P/J1 header is shown in the figure below. The tables following the fugure give the designation of its contacts.

Figure 4.10: ISA Header Contacts Layout



Please, see this connector's pinout tables on the next pages.

Table 4.17: ISA P/J1 Connector (Rows A and B) Contacts Designation

Pin #	Signal	In/Out	Pin #	Signal	In/Out
A1	/IOCHK	–	B1	GND	Power
A2	SD7	In/Out	B2	RESET	Out
A3	SD6	In/Out	B3	+5V	Power
A4	SD5	In/Out	B4	IRQ9	In
A5	SD4	In/Out	B5	-5V	–
A6	SD3	In/Out	B6	DRQ2	In
A7	SD2	In/Out	B7	-12V	Power
A8	SD1	In/Out	B8	0WS	In
A9	SD0	In/Out	B9	+12V	Power
A10	IOCHRDY	In	B10	GND	Power
A11	AEN	Out	B11	/SMEMW	Out
A12	SA19	Out	B12	/SMEMR	Out
A13	SA18	Out	B13	/IOW	Out
A14	SA17	Out	B14	/IOR	Out
A15	SA16	Out	B15	/DACK3	Out
A16	SA15	Out	B16	DRQ3	In
A17	SA14	Out	B17	/DACK1	Out
A18	SA13	Out	B18	DRQ1	In
A19	SA12	Out	B19	/REFRESH	Out
A20	SA11	Out	B20	BCLK	Out
A21	SA10	Out	B21	IRQ7	In
A22	SA9	Out	B22	IRQ6	In
A23	SA8	Out	B23	IRQ5	In
A24	SA7	Out	B24	IRQ4	In
A25	SA6	Out	B25	IRQ3	In

Pin #	Signal	In/Out	Pin #	Signal	In/Out
A26	SA5	Out	B26	/DACK2	Out
A27	SA4	Out	B27	TC	Out
A28	SA3	Out	B28	BALE	Out
A29	SA2	Out	B29	+5V	Power
A30	SA1	Out	B30	OSC	Out
A31	SA0	Out	B31	GND	Power

Table 4.18: ISA P/J1 (Rows C and D) Contacts Designation

Pin #	Signal	In/Out	Pin #	Signal	In/Out
C0	GND	In	D0	GND	In
C1	/SBHE	Out	D1	/MEMCS16	In
C2	LA23	Out	D2	/IOCS16	In
C3	LA22	Out	D3	IRQ10	In
C4	LA21	Out	D4	IRQ11	In
C5	LA20	Out	D5	IRQ12	In
C6	LA19	Out	D6	IRQ13	In
C7	LA18	Out	D7	IRQ14	In
C8	LA17	Out	D8	/DACK0	Out
C9	/MEMR	Out	D9	DRQ0	In
C10	/MEMW	Out	D10	/DACK5	Out
C11	SD8	In/Out	D11	DRQ5	In
C12	SD9	In/Out	D12	/DACK6	Out
C13	SD10	In/Out	D13	DRQ6	In
C14	SD11	In/Out	D14	/DACK7	Out
C15	SD12	In/Out	D15	DRQ7	In
C16	SD13	In/Out	D16	+5V	In
C17	SD14	In/Out	D17	/MASTER	In
C18	SD15	In/Out	D18	GND	In
C19	KEY	–	D19	GND	In

Note:

In two tables above:

"–" - Not used;
"Power" - supplied to the module installed into a crate
In/Out column shows the data transfer direction for a processor module being the bus master.

4.3.20 PCI Header

PC/104-Plus standard specifies availability of 120-pin (30x4) 2 mm header located on the top side of the board. This interface header accepts 3 stackable modules and carries all of the appropriate 32-bit 33 MHz PCI signals. PCI bus mastering devices are supported on the PC/104-Plus header.

Figure 4.11: PCI Connector (P/J2) Contacts Layout

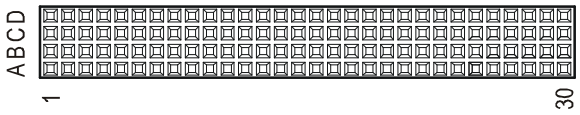


Table 4.19: PC/104-Plus P/J2 Connector Contacts Designation

Pin	A	B	C	D
1	GND	Reserved	+5	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0#	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1#	AD15	+3.3V
9	SERR#	GND	Reserved	PAR
10	GND	PERR#	+3.3V	Reserved
11	STOP#	+3.3V	LOCK#	GND
12	+3.3V	TRDY#	GND	DEVSEL#
13	FRAME#	GND	IRDY#	+3.3V
14	GND	AD16	+3.3V	C/BE2#
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3#	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0#	GND	REQ1#	VI/O
24	GND	REQ2#	+5V	GNT0#
25	GNT1#	VI/O	GNT2#	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD#	+5V	RST#
29	+12V	INTA#	INTB#	INTC#
30	-12V	REQ3#	GNT3#	GND

4.3.21 Diagnostic LEDs

CPC304 has seven diagnostic LEDs (D1, D6, D11, D12, D20, D26, D27; Figure 4.2) on the top side of the module. If the processor module is installed into the mounting cage, additional light pipes can be installed to conduct the light to the front panel. The following table describes the function of these LEDs.

Table 4.20: CPC304 Diagnostic LEDs Function

LED	Color	Function
D11	Green	User LED1
D12	Green	User LED2
D27	Yellow	Processor reset by WDT. This LED lights up when the processor was reset on WDT timeout expiry. It should not lit during normal operation.
D20	Orange	IDE activity
D1	Green	Ethernet controller 1 activity
D6	Green	Ethernet controller 2 activity
D26	Green/Yellow	Power mode: green = operation, yellow = sleep

User LEDs are controlled via Super IO GPIO: LED1 via GPIO23 and LED2 via GPIO35 (1 = LED is off, 0 = LED is on). They are switched on and off by a BIOS procedure, which can be invoked from user application programs.

4.3.22 Discrete Input/Output

CPC304 offers 8 programmable input/output channels routed to J5 one-row connector on the top side of the module. Discrete input/output lines are connected to Super IO GPIO lines via protective current-limiting circuits. Maximum output current is 20 mA per channel. The channels have outputs imitating open collector. Samples of Winbond W83627HF Super IO GPIO programming can be found in documentation CD files. The following table shows J5 contacts designation.

Table 4.21: J5 Contacts Designation

Contact	GPIO Line	Signal
1	GPIO10	DISCIO_0
2	GPIO11	DISCIO_1
3	GPIO12	DISCIO_2
4	GPIO13	DISCIO_3
5	GPIO14	DISCIO_4
6	GPIO15	DISCIO_5
7	GPIO16	DISCIO_6
8	GPIO17	DISCIO_7
9	–	GND

4.3.23 PME Connector

An external PME signal can be accepted via J6 connector on the top side of CPC304. The table below will be amended.

Table 4.22: J6 PME Connector Pinout

Contact	–	Signal
1		(TBD)
2		(TBD)
3		(TBD)
4		(TBD)

4.3.24 Power Supply Connector

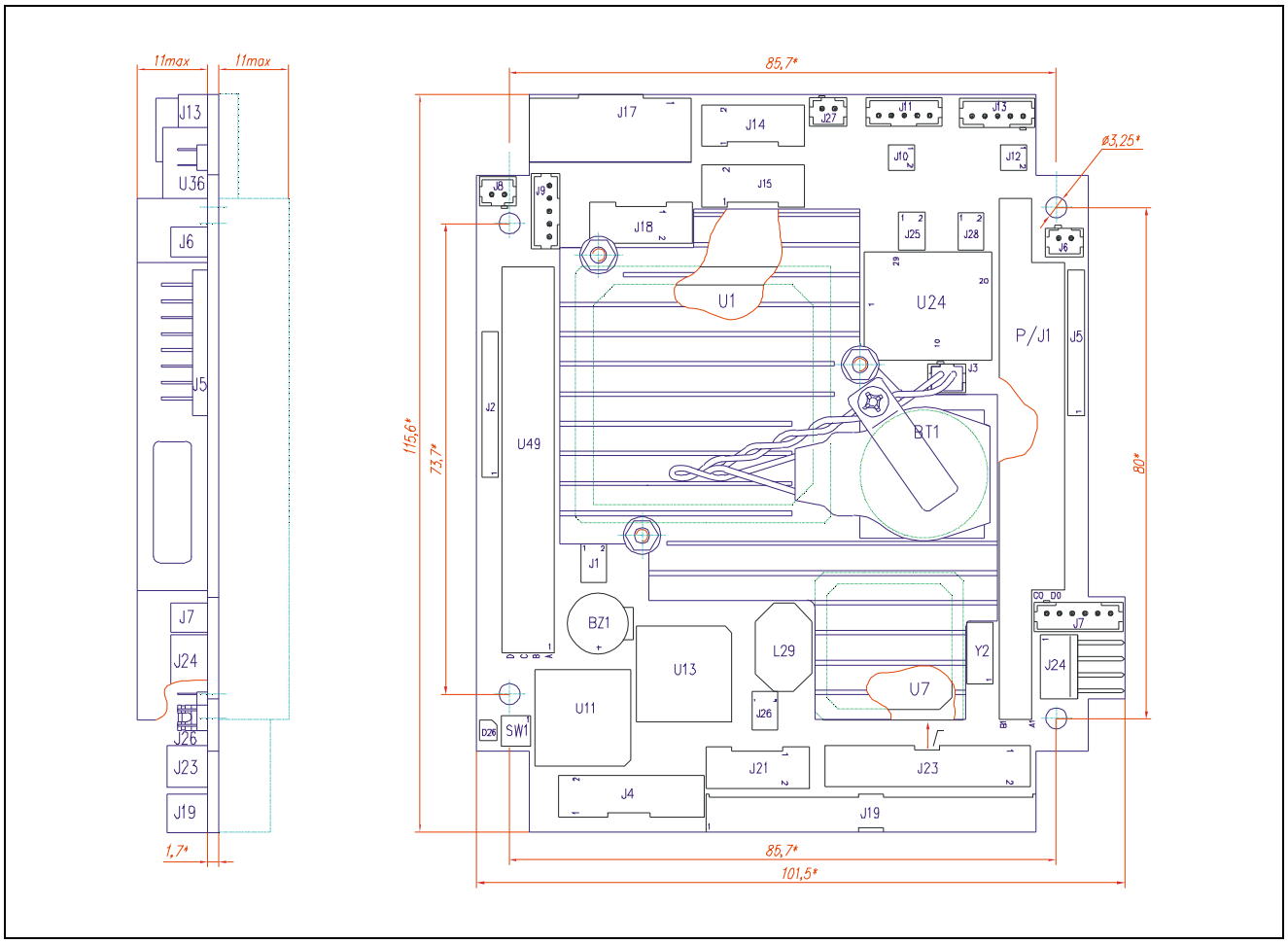
The power is supplied to CPC304 via PC/104 connector or via dedicated J24 connector. The main power voltage of the processor module is +5V. +12 V is supplied via J24 connector for use by PC/104 expansion modules, but is not used in CPC304. The following table gives J24 contacts' assignments.

Table 4.23: J24 Power Connector Pinout

Pin	Assignment
1	+5 V
2	GND
3	GND
4	+12 V

4.4 Overall and Mounting Dimensions

Figure 4.12: CPC304 Top Side: Overall and Mounting Dimensions



5 General Software® BIOS

The General Software® BIOS in CPC304 is an adapted version of a standard BIOS for IBM PC AT-compatible personal computers equipped with Intel®x86 and compatible processors. BIOS provides low-level support for the central processing, memory, and I/O system units.

5.1 BIOS Setup Program. Introduction

With the BIOS Setup program, you can modify BIOS settings and control special features of the module. The Setup program offers a convenient menu interface to modify basic system configuration settings and switching between the subsystems operation modes. These settings are stored in a dedicated battery-backed memory, CMOS RAM, that keeps the information when the power is switched off.

6 Appendices

6.1 Jumper Settings by Function

Table 6.1: Jumper Settings by Function

Function	Jumper	Short Description (*)
Terminators on COM3 in RS-422/RS-485 modes	J10: 1-2	Enable terminator between TX+ и TX- lines of COM3 port in RS422 mode or between D+ and D- lines of COM3 port in RS485 mode
	J10: 3-4	Enable terminator between RX+ and RX- lines of COM3 port in RS422 mode
Terminators on COM4 in RS-422/RS-485 modes	J12: 1-2	Enable terminator between TX+ and TX- lines of COM4 port in RS422 mode or between D+ and D- lines of COM4 port in RS485 mode
	J12: 3-4	Enable terminator between RX+ and RX- lines of COM4 port in RS422 mode
Enable/Disable WDTs	J25: 1-2	Enable WDT1
	J25: 3-4	Enable WDT2
CompactFlash and NAND Flash operation mode	J26: 3-4	CompactFlash – Master, NAND Flash – Slave
	J26: 1-2	CompactFlash – Slave, NAND Flash – Master
–	J28	Reserved jumper. Pins 1-3 and 4-6 must be closed!
		(*) *The action described in this column corresponds to the closed jumper contacts*